

CALIFORNIA OAK MORTALITY TASK FORCE REPORT TO THE BOARD OF FORESTRY FEBRUARY 2013

MONITORING

Three new positive waterways were identified in Georgia, Texas, and Washington in 2012 as a result of the National *P. ramorum* Early Detection Survey of Forests, bringing the total number of known positive sites outside of the established disease range in CA and OR to 15. Seventeen states participated in the program, for a total of 114 stream baiting locations in all. Of the 12 previously positive sites in AL, FL, GA, MS, NC, and WA, 11 were surveyed in 2012 and continue to be positive, reinforcing the trend of annual repeat detections once a site is initially confirmed.

The newly identified Texas stream was baited in response to positive soil findings at an associated nursery in the summer of 2012; however, no *P. ramorum*-positive plants were identified. The last time the nursery had confirmed positive plants was in 2004 as a result of the nationwide *P. ramorum*-positive Camellia shipment. Water baiting in the stream outside of that nursery was also conducted in 2010 and found negative.

Washington's 2012 *P. ramorum* early detection survey of forests resulted in four positive water confirmations. One of the sites was a new *P. ramorum*-positive location: a watershed sub-basin adjoining the Sammamish River, King County (which has been *P. ramorum* positive since 2007). Three other locations were repeat positives for *P. ramorum*: one in a stream that feeds into the Sammamish River, one in the Sammamish River, and one in a Lewis County stream in a forested area. None of the finds were in association with streamside plant infections. In total, there were 12 baiting traps in 11 western Washington streams in 2012. All baited streams were associated with nurseries previously identified with *P. ramorum*-positive plant stock.

The 2011 survey of water baiting methods (comparing in vitro baiting, *Bottle O'Bait*, and in situ baiting, *bags*) was expanded in 2012 and yielded consistent results with those obtained in 2011. Sampling occurred at 25 positive sites in 6 states. The pathogen was recovered by one or both assays in 139 comparable cases. In vitro baiting was the more effective method overall (55 percent of recoveries); however, after analysis with 2011 data, it was clear the advantage was seasonally based, with spring being optimal. The rate of *P. ramorum* recovery overall was lower in the fall, at which time in situ baiting was a more reliable method. The pathogen was recovered by in vitro assay at nine sites over the two survey years when in situ baiting failed. Without in vitro baiting, these sites would have been classified *P. ramorum* negative. However, there was one site in 2012 where in situ succeeded and BOB failed. Based on survey results, 2013 National *P. ramorum* Early Detection Survey of Forests cooperators will have the option of using either assay. Unfortunately, due to budget shortfalls, it is anticipated that the 2013 program will be greatly reduced.



Submissions for the 2013 SODMAP are now being accepted by the UC Berkeley Garbelotto lab. Laboratory confirmed (culturing, enzyme immunoassays, PCR, etc.) *P. ramorum*-positive and -negative findings from non-nursery samples are encouraged. If you submitted data previously, this submission should be an update and should only include new findings. Submissions are due by 3/15/13. For submission guidelines or questions, or to submit your findings, email Doug Schmidt at dschmidt@berkeley.edu.

SODMAP is a partnership of scientists and citizens, working together to create the most complete distribution map of a forest disease ever produced in America. It incorporates laboratory confirmed collections of *P. ramorum* plant and water samples from 2005 to the present, and includes both positive and negative specimens to better illustrate the known range and distribution of the Sudden Oak Death pathogen.

NURSERIES

Thirty-three nurseries in eight states (CA, OR, WA, NC, ME, NY, PA. and IN) had *P. ramorum* confirmations in 2012 (up from 23 nurseries in 5 states in 2011), including 17 interstate shippers (16 in regulated states and 1 in NY) and 16 non-interstate shippers. Sixteen of the finds (48.5%) were first time detections (CA-3, OR-7, WA-2, NY-1, IN-1) and 17 (51.5%) were repeat nurseries. Although host plants from *P. ramorum*-positive nurseries were shipped to 33 states, when trace-forward investigations were conducted, positive plants were detected in only 2 non-interstate shipping nurseries (ME, PA) and four residential (ME, CA, OR, WA) locations. Of the four positive residential finds, two (ME, CA) were traced back to a nursery in OR and two (OR, WA) were traced back to a WA nursery.

High-risk host plants comprised 85% of confirmations: *Rhododendron* (OR-16, WA-14, CA-7, NY-7, ME-5, PA-1, IN-1), *Camellia* (CA-5, OR-4, WA-1, NC-1), *Viburnum* (OR-7, WA-2, CA-1), *Pieris* (OR-4, WA-2, NY-1), and *Kalmia* (OR-2, NY-1). The remaining 15% of confirmations came from: *Cornus kousa* (OR-1), *Gaultheria procumbens*-a newly identified host-(WA-1, ME-1, OR-1), *Gaultheria shallon* (OR-1), *Hamamelis intermedia* (OR-1), *Hamamelis virginiana* (OR-1), *Loropetalum chinense* (CA-3), *Magnolia grandiflora* (OR-2, WA-1), *Prunus laurocerasus* (OR-1), *Trachelospermum jasminoides* (CA-1), cull pile material(OR-1), potting media(OR-3), soil substrate (OR-4, CA-2, ME-2, WA-1), and water (WA-6, NY-2).

California Nursery-Related Summary, 2012 – California had seven *P. ramorum*-positive nurseries in 2012, of which four were previously positive. Five confirmations came from production facilities and two were retail. Two of the nurseries were in the quarantine area and five were in the regulated area. Of the 18,235 samples tested, there were 17 positive plant samples (6- *Camellia*, 6-*Rhododendron*, 1-*Viburnum*, 3-*Loropetalum*, 1- *Trachelospermum*).

Oregon Nursery-Related Summary, 2012 – Oregon tested 21,353 samples for *P. ramorum* from 542 grower sites as part of the Federal *P. ramorum* Certification Program in 2012. The pathogen was detected at 11 nurseries on *Camellia*, *Hamamelis virginiana*,



Kalmia latifolia, *Pieris*, *Rhododendron*, and *Viburnum*. Delimitation surveys within the positive nurseries detected additional infections on *Camellia*, *Cornus kousa*, *H. intermedia*, *Magnolia grandiflora*, *Pieris*, *Prunus laurocerasus*, *Rhododendron*, and *Viburnum*, as well as in potting media, soil, and a cull pile. All of the nurseries underwent the USDA Confirmed Nursery Protocol. *P. ramorum* was also detected at a residential site on *Gaultheria shallon* and *G. procumbens* plants imported from a *P. ramorum*-positive nursery in Washington. This was the first time *Gaultheria procumbens* had ever been found positive for the pathogen. The USDA Confirmed Residential Protocol was enacted and completed at the site.

REGULATIONS

As of 12/10/12, the USDA Animal and Plant Health Inspection Service (APHIS) amended the federal order (FO) regarding advance notification for interstate shipments of *P. ramorum* high-risk host nursery stock. Interstate shipments of *Camellia*, *Kalmia*, *Pieris*, *Rhododendron* (including Azalea), and *Viburnum* nursery stock from all 14 quarantine California counties and Curry County, OR must continue to provide written notification to non-regulated states. However, only previously (since 2010) or newly positive nurseries in the regulated areas of California, Oregon, and Washington shipping any species of *Camellia*, *Kalmia*, *Pieris*, *Rhododendron* (including Azalea), and *Viburnum* to non-regulated states are now required to pre-notify. Nurseries located in the regulated areas with no positive detections for the last 3 consecutive years are no longer required to pre-notify. In the future, if *P. ramorum* is detected at a nursery in the regulated area, it will also be required to provide pre-notifications. The above revision to the FO removed the pre-notification requirement for hundreds of nurseries that have never been positive for *P. ramorum*.

APHIS and the state regulatory agencies in CA, OR, and WA jointly reviewed the history of nurseries in the regulated areas and determined which ones are affected by the FO. Nurseries that need to comply have been notified. Affected nurseries must comply with the requirement while under the Confirmed Nursery Protocol and for two years after release. Advance notifications serve as an additional source of information for states receiving high-risk *P. ramorum* host nursery stock and at the same time minimize burden on the regulatory agencies and the nursery industry. Any newly positive nursery is required to provide the state and APHIS with trace information.

To access the FO and guidance document, go to http://www.aphis.usda.gov/plant_health/plant_pest_info/pram/index.shtml. For more information, contact Prakash Hebbar at (301) 851-2228 or prakash.hebbar@aphis.usda.gov or Stacy Scott at (970) 494-7577 or stacy.e.scott@aphis.usda.gov.

MANAGEMENT

Sudden Oak Death in Curry County, Oregon, 2012 Review - Sudden Oak Death continued to intensify and spread in Curry county forests during 2012 (figure 1). As expected, this was most noticeable on the northern disease front and near areas where



eradication treatments were suspended several times since 2009 because of lack of funds. Several new infestations were also found at considerable distance from other known infestations and in unexpected places, such as the Wheeler Creek and East Fork Winchuck River (figure 2). New infestations were discovered as a result of aerial, ground, and stream-bait surveys. Increased emphasis on ground surveys in areas where dead trees are not yet evident has resulted in several very early detections. Stream baits continue to be an important part of the early detection system.

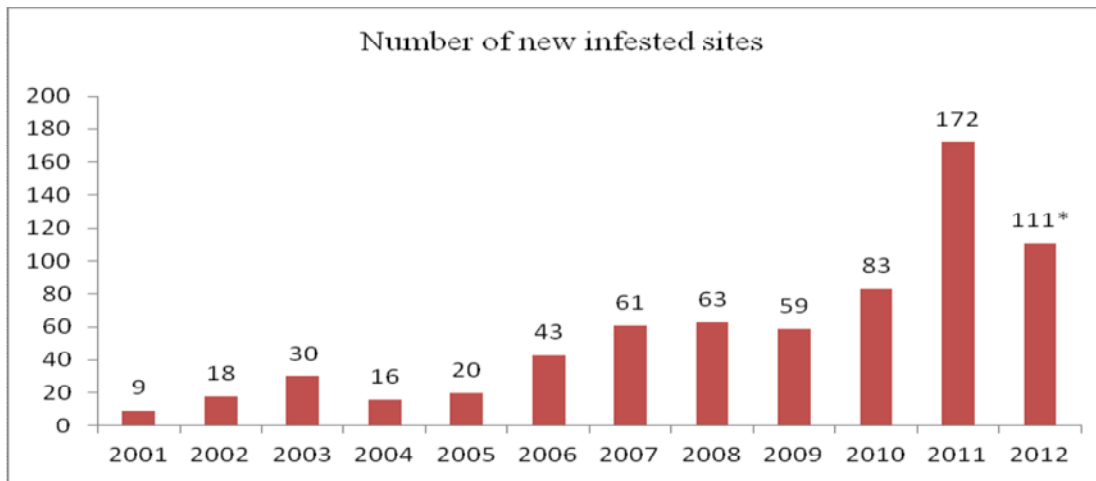


Figure 1 - Number of new sites infested with *Phytophthora ramorum* discovered annually between 2001 and 2012 in Curry County, Oregon. *Data for 2012 understates the amount of disease because of decreased survey effort within the generally infested area.

Expansion and intensification of disease lead to an increase in the quarantine area to 202 mi² in March 2012, and then to 264 mi² in January 2013 (the latter will go into effect in February 2013). Key provisions of the revised quarantine rule include: 1) establishing a “Generally Infested Area (GIA)” within the quarantine boundary where *P. ramorum* has persisted or intensified and treatment is no longer required by the State; 2) defining high-priority sites where eradication treatments are required, and 3) allowing increased utilization of tanoak within the quarantine area.

Eradication treatments are underway on private land furthest from the generally infested area and nearest the quarantine boundary. Outlier infestations and leading edges of the disease front remain highest priority for treatment. All sites on federal land (USFS and BLM) are in the process of being treated or are undergoing delimitation surveys in preparation for treatment.

The goal of the Oregon SOD program is to slow spread by: 1) early detection and rapid eradication of new infestations that are epidemiologically important, 2) reducing inoculum levels wherever practical through cost-share projects and best management practices, and 3) improved education and outreach to prevent spread. Early detection remains one of our biggest challenges and will be an emphasis in 2013.

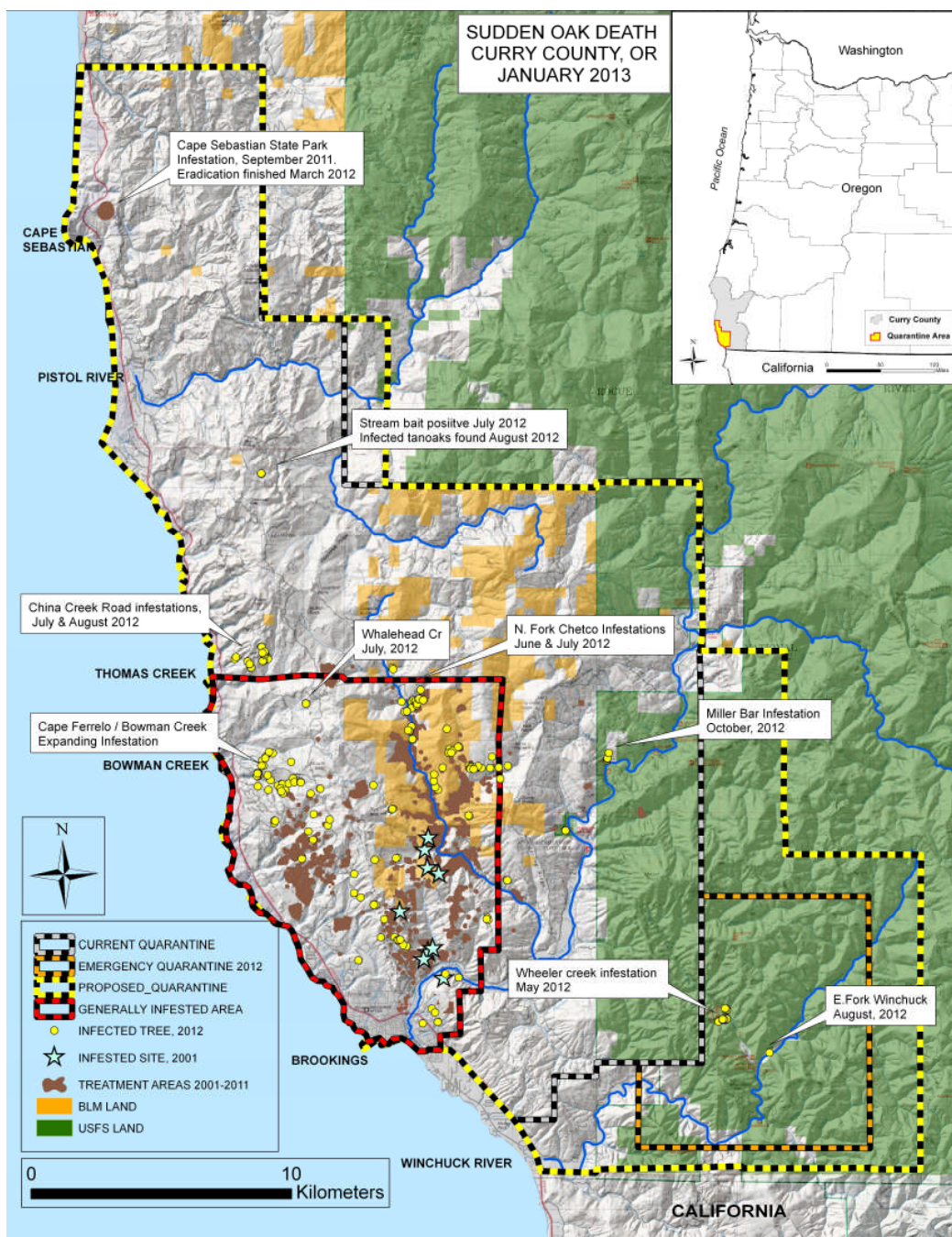


Figure 2. Location of sites infested with *Phytophthora ramorum* in southwest Oregon that were discovered in 2012 and changes to quarantine boundaries. Infested sites enlarged for visibility.

RESEARCH

Chen, W.; Djama, Z.R.; Coffey, M.D.; Martin, F.N.; Bilodeau, G.J.; Radmer, L.; Denton, G.; and Lévesque, C.A. 2013. Membrane-Based Oligonucleotide Array Developed from Multiple Markers for the Detection of Many *Phytophthora* Species. *Phytopathology*. 103(1): 43-54.



Abstract: Most *Phytophthora* spp. are destructive plant pathogens; therefore, effective monitoring and accurate early detection are important means of preventing potential epidemics and outbreaks of diseases. In the current study, a membrane-based oligonucleotide array was developed that can detect *Phytophthora* spp. reliably using three DNA regions; namely, the internal transcribed spacer (ITS), the 5' end of cytochrome *c* oxidase 1 gene (*cox1*), and the intergenic region between cytochrome *c* oxidase 2 gene (*cox2*) and *cox1* (*cox2-1spacer*). Each sequence data set contained ≈ 250 sequences representing 98 described and 15 undescribed species of *Phytophthora*. The array was validated with 143 pure cultures and 35 field samples. Together, nonrejected oligonucleotides from all three markers have the ability to reliably detect 82 described and 8 undescribed *Phytophthora* spp., including several quarantine or regulated pathogens such as *Phytophthora ramorum*. Our results showed that a DNA array containing signature oligonucleotides designed from multiple genomic regions provided robustness and redundancy for the detection and differentiation of closely related taxon groups. This array has the potential to be used as a routine diagnostic tool for *Phytophthora* spp. from complex environmental samples without the need for extensive growth of cultures.

RELATED RESEARCH

Aguayo, J.; Adams, G.C.; Halkett, F.; Catal, M.; Husson, C.; Nagy, Z.Á.; Hansen, E.M.; Marçais, B.; and Frey, P. 2013. Strong Genetic Differentiation Between North American and European Populations of *Phytophthora alni* subsp. *uniformis*. *Phytopathology*. 103(2): 190-199.

Hüberli, D.; St. J. Hardy, G.E.; White, D.; Williams, N.; Burgess, T.I. 2013. Fishing for *Phytophthora* from Western Australia's waterways: a distribution and diversity survey. *Australasian Plant Pathology*. DOI: 10.1007/s13313-012-0195-6. (Online First view)

Olson, H.A.; Jeffers, S.N.; Ivors, K.L.; Steddom, K.C.; Williams-Woodward, J.L.; Mmbaga, M.T.; Benson, D.M.; and Hong, C.X. 2013. Diversity and Mefenoxam Sensitivity of *Phytophthora* spp. Associated with the Ornamental Horticulture Industry in the Southeastern United States. *Plant Disease*. 97(1): 86-92.

Pagliaccia, D.; Pond, E.; McKee, B.; and Douhan, G.W. 2013. Population Genetic Structure of *Phytophthora cinnamomi* Associated with Avocado in California and the Discovery of a Potentially Recent Introduction of a New Clonal Lineage. *Phytopathology*. 103(1): 91-97.

PERSONNEL

Sibdas Ghosh will be leaving his position with the National Ornamentals Research Site at Dominican University of California (NORS-DUC) in late March for a position as the Dean of the School of Arts and Science at Iona College in New Rochelle, NY. After leaving Dominican University, he can be reached at ghosh.sibdas@gmail.com.

**CALENDAR OF EVENTS**

- 2/13 - SOD Treatment Workshop; meet at oak outside of Tolman Hall, UC**
Berkeley Campus; 1:00 – 3:00 p.m.; Pre-registration is required. This class is free and will be held rain or shine. To register, or for questions, email kpalmieri@berkeley.edu, and provide your name, phone number, affiliation and license number (if applicable), and the date for which you are registering. For more information, go to <http://nature.berkeley.edu/garbelotto/english/sodtreatmenttraining.php>.
- 3/6 - SOD Treatment Workshop; meet at oak outside of Tolman Hall, UC**
Berkeley Campus; 1:00 – 3:00 p.m.; Pre-registration is required. For more information, see the 2/13 listing above.
- 4/10 - SOD Treatment Workshop; meet at oak outside of Tolman Hall, UC**
Berkeley Campus; 1:00 – 3:00 p.m.; Pre-registration is required. For more information, see the 2/13 listing above.
- 5/1 - SOD Treatment Workshop; meet at oak outside of Tolman Hall, UC**
Berkeley Campus; 1:00 – 3:00 p.m.; Pre-registration is required. For more information, see the 2/13 listing above.
- 9/4 - SOD Treatment Workshop; meet at oak outside of Tolman Hall, UC**
Berkeley Campus; 1:00 – 3:00 p.m.; Pre-registration is required. For more information, see the 2/13 listing above.
- 10/2 - SOD Treatment Workshop; meet at oak outside of Tolman Hall, UC**
Berkeley Campus; 1:00 – 3:00 p.m.; Pre-registration is required. For more information, see the 2/13 listing above.
- 10/23 - SOD Treatment Workshop; meet at oak outside of Tolman Hall, UC**
Berkeley Campus; 1:00 – 3:00 p.m.; Pre-registration is required. For more information, see the 2/13 listing above.
- 11/13 - SOD Treatment Workshop; meet at oak outside of Tolman Hall, UC**
Berkeley Campus; 1:00 – 3:00 p.m.; Pre-registration is required. For more information, see the 2/13 listing above.